Introduction

Neuroscience is a challenging topic to teach, regardless of the student’s educational level or prior experience in the biological and health sciences. The purpose of this project was to:

1) Facilitate neurophysiology instruction to first year medical students at the Virginia Tech-Carilion School of Medicine (VTCSOM; Roanoke, VA; https://medicine.vtc.vt.edu/).

2) Provide an opportunity for Virginia Tech medical students and graduate students to work together and gain experience teaching neuroscience through Science-Technology-Engineering-Math outreach.

3) Introduce basic principles of neuroscience to elementary school students in the Roanoke, VA community.

VTCSOM Neuroscience Curriculum

- The first year of the VTCSOM M1 curriculum concludes with an eight-week block that focuses on the neurosciences.
- For the basic science domain, this curriculum combines sessions on basic neuroscience, gross neuroanatomy, and a Problem-Based Learning case the students work through throughout each week, culminating in the opportunity for the students to meet with the physician, patient, and patient’s family or caretakers.
- Lecture sessions include hands-on activities, which are used to demonstrate basic neuroscience principles in our outreach program.
- At the end of their neuroscience block in the Spring of FY2020, students had the opportunity to demonstrate their knowledge of neuroscience by participating in an outreach event at Grandin Court Elementary School.

Community Outreach Opportunity

Prior to our outreach event at Grandin Court Elementary School, VTCSOM medical students and Virginia Tech graduate students met in advance to plan and run through the activities. Several days later, these students introduced basic neuroscience to 150 third, fourth, and fifth graders and their teachers at Grandin Court Elementary School (Roanoke, VA). We met with 50 students at a time, for one hour per group.

Introductory Session

First 10 minutes – Interactive discussion of the functions of the brain (and why we need one).

Activity Rotation

Next 40 minutes – Kids were split into smaller groups and rotated through four interactive neuroscience demonstrations every 10 min:

A. Electricity of the Nervous System:
We demonstrated the electrical activity hidden within our muscles using an EMG device. Kids volunteered to have their arm muscles tested. We explained the general concept of action potentials, and how they propagate up and down neural pathways to help their brain communicate with their muscles.

B. Reflexes:
We used reflex hammers and the patellar reflex to explain why we do not always need a brain. Kids volunteered to have their reflexes tested, and also tested the reflexes of the professional students.

C. Comparative Neuroanatomy:
We had elementary students match images of mammals with images of brains. Anatomical models and real brains were also used to compare/contrast structure and function in humans, sheep, and mice.

D. Visual Plasticity:
We explained how our visual system adapts to the world around us. We showed illusions and explained how our brain adjusts to fill in missing information. We also used vision distortion goggles to demonstrate how our brains can adapt to accommodate new perceptions of reality.

Concluding Session

Last 10 minutes - Wrap-up session with the entire group that focused on how we can keep our brains healthy. We had squishy brains from the Visual Plasticity activity for each of the kids to take home.

Additional Information

- This project was supported by generous funding from the VTCSOM Department of Basic Science Education, and a 2019 Instructional Innovation Grant from the Virginia Tech Center for Excellence in Teaching and Learning (to KKR).
- For the publication of this study, written permission was acquired for showing faces of Virginia Tech graduate and medical students, and Grandin Court Elementary School students.

Results

- The medical students who participated in the outreach event "felt personal satisfaction and enjoyment having had the experience", conveyed a “desire for future opportunities to teach in the community”, and felt that they “understood neurophysiology better after having to teach it to the children”.
- The elementary school children seemed to greatly enjoy the experience. The activities kept them engaged for the duration of the event, and they learned about several important topics related to their bodies.
- The elementary school teachers also enjoyed the experience, and have already invited us back for next year.
- Thanks to word-of-mouth, the success of this project has also opened up new opportunities with additional community partners and additional schools.

Conclusion

Community outreach is a valuable tool that may improve medical student education.